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## NOTICE OF ALLOWANCE AND FEE(S) DUE

8791

7590

05/13/2010

BLAKELY SOKOLOFF TAYLOR & ZAFMAN LLP  
1279 OAKMEAD PARKWAY  
SUNNYVALE, CA 94085-4040

EXAMINER

HALLENBECK-HUBER, JEREMIAH CHARLES

ART UNIT

PAPER NUMBER

2621

DATE MAILED: 05/13/2010

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/816,051	03/31/2004	Sundar Vedula	080398.P581	9617

TITLE OF INVENTION: SEMANTICS-BASED MOTION ESTIMATION FOR MULTI-VIEW VIDEO CODING

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	\$1510	\$300	\$0	\$1810	08/13/2010

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. **PROSECUTION ON THE MERITS IS CLOSED.** THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN **THREE MONTHS** FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. **THIS STATUTORY PERIOD CANNOT BE EXTENDED.** SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

## HOW TO REPLY TO THIS NOTICE:

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If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

**IMPORTANT REMINDER:** Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

# **PART B - FEE(S) TRANSMITTAL**

**Complete and send this form, together with applicable fee(s), to:** Mail **Mail Stop ISSUE FEE**  
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**INSTRUCTIONS:** This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

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Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

8791 7590 05/13/2010

**BLAKELY SOKOLOFF TAYLOR & ZAFMAN LLP**  
**1279 OAKMEAD PARKWAY**  
**SUNNYVALE, CA 94085-4040**

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I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/816,051 03/31/2004

Sundar Vedula

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nonprovisional

NO

\$1510

\$300

\$0

\$1810

08/13/2010

EXAMINER	ART UNIT	CLASS-SUBCLASS
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HALLENBECK-HUBER, JEREMIAH

2621

375-240120

<p>1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).</p> <p><input type="checkbox"/> Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.</p> <p><input type="checkbox"/> "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. Use of a <b>Customer Number is required.</b></p>	<p>2. For printing on the patent front page, list</p> <p>(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,</p> <p>(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.</p>
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## **3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)**

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

## **4a. The following fee(s) are submitted:**

- ☐ Issue Fee
- ☐ Publication Fee (No small entity discount permitted)
- ☐ Advance Order - # of Copies \_\_\_\_\_

## **4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)**

- ☐ A check is enclosed.
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- ☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number \_\_\_\_\_ (enclose an extra copy of this form).

## **5. Change in Entity Status (from status indicated above)**

- ☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27. ☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature \_\_\_\_\_ Date \_\_\_\_\_

Typed or printed name \_\_\_\_\_ Registration No. \_\_\_\_\_

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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8791	7590	05/13/2010	EXAMINER	
BLAKELY SOKOLOFF TAYLOR & ZAFMAN LLP 1279 OAKMEAD PARKWAY SUNNYVALE, CA 94085-4040			HALLENBECK-HUBER, JEREMIAH CHARLES	
			ART UNIT	PAPER NUMBER

2621

DATE MAILED: 05/13/2010

## Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 844 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 844 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

**Notice of Allowability****Application No.**

10/816,051

**Applicant(s)**

VEDULA ET AL.

**Examiner**

JEREMIAH C. HUBER

**Art Unit**

2621

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the amendment filed on Feb. 10, 2010.
2. ☒ The allowed claim(s) is/are 1-6,9-17,19-23 and 25-31.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some\* c) ☐ None of the:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.  
(a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached  
1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.  
(b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.  
Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08),  
Paper No./Mail Date \_\_\_\_\_
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413),  
Paper No./Mail Date \_\_\_\_\_
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_\_.

/Jeremiah C Huber/  
Examiner, Art Unit 2621

/Mehrdad Dastouri/  
Supervisory Patent Examiner, Art Unit 2621

### EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview and accompanying emails with Joseph Sosinski on 5/7/2010.

The application has been amended as follows:

1. A ~~motion~~ difference vector estimation method comprising:

identifying, by a computer, one or more pixels in a first frame of a multi-view video sequence;

constraining a search range associated with a second frame of ~~the~~ said multi-view video sequence to a first area vertically centered on an epipolar line in the second frame, wherein ~~the~~ said epipolar line corresponds to ~~the~~ said one or more pixels in the first frame, the first area is defined by a having a vertical height specified by a first correlation between efficient compression and semantic accuracy received by the computer from a user, wherein ~~the~~ said vertical height increases if the first correlation is weighted toward efficient compression and ~~the~~ said vertical height decreases if the first correlation is weighted toward semantic accuracy, ~~and the wherein~~ semantic accuracy relies on use of geometric configurations of cameras capturing the multi-view video sequence, wherein the vertical direction is defined as the direction perpendicular to said epipolar line, and wherein ~~the~~ said search range is further constrained using a disparity

vector computed for ~~the~~ said one or more pixels in the first frame and wherein the constrained search range is repositioned relative to ~~the~~ said epipolar line using ~~the~~ said disparity vector in addition to constraining ~~the~~ said vertical height using the first correlation;

searching the second frame within ~~the~~ said constrained search range for a match of ~~the~~ said one or more pixels identified in the first frame for subsequent use in computing a difference vector for ~~the~~ said one or more pixels in the first frame, ~~the~~ said difference vector to be transmitted as part of a compressed representation of the first frame;

receiving a second correlation between efficient compression and semantic accuracy from the user; and

searching a third frame within a search range constrained by a second correlation between efficient compression and semantic accuracy, the second correlation specified by the user and a value of the second correlation is different from a value of the first correlation.

12. A non-transitory computer readable memory medium that provides computer program instructions, which when executed on a computer processor cause the processor to perform operations comprising:

identifying one or more pixels in a first frame of a multi-view video sequence;

constraining a search range associated with a second frame of the multi-view video sequence to a first area vertically centered on an epipolar line in the second

frame, wherein ~~the~~ said epipolar line corresponds to the one or more pixels in the first frame, the first area is defined by ~~a~~ having a vertical height specified by a first correlation between efficient compression and semantic accuracy received from a user, wherein ~~the~~ said vertical height increases if the first correlation is weighted toward efficient compression and ~~the~~ said vertical height decreases if the first correlation is weighted toward semantic accuracy, ~~and the~~ wherein semantic accuracy relies on use of geometric configurations of cameras capturing the multi-view video sequence, wherein the vertical dimension is defined as the direction perpendicular to said epipolar line and wherein ~~the~~ said search range is further constrained using a disparity vector computed for ~~the~~ said one or more pixels of the first frame and wherein ~~the~~ said constrained search range is repositioned relative to ~~the~~ said epipolar line using ~~the~~ said disparity vector in addition to constraining ~~the~~ said vertical height using the first correlation;

searching the second frame within ~~the~~ said constrained search range for a match of ~~the~~ said one or more pixels identified in the first frame for subsequent use in computing a difference vector for the one or more pixels, ~~the~~ said difference vector to be transmitted as part of a compressed representation of the first frame;

receiving a second correlation between efficient compression and semantic accuracy from the user; and

searching a third frame within a search range constrained by a second correlation between efficient compression and semantic accuracy, the second

correlation specified by the user and a value of the second correlation is different from a value of the first correlation.

20. A computerized system comprising:

a memory; and

at least one processor coupled to the memory, the at least one processor executing a set of instructions which cause the at least one processor to

identify one or more pixels in a first frame of a multi-view video sequence, constrain a search range associated with a second frame of the multi-view video sequence to a first area vertically centered on an epipolar line in the second frame, wherein ~~the~~ said epipolar line corresponds to ~~the~~ said one or more pixels in the first frame, the first area is defined by ~~a~~ having a vertical height specified by a first correlation between efficient compression and semantic accuracy received from a user, wherein ~~the~~ said vertical height increases if the first correlation is weighted toward efficient compression and ~~the~~ said vertical height decreases if the first correlation is weighted toward semantic accuracy, ~~and the~~ wherein semantic accuracy relies on use of geometric configurations of cameras capturing the multi-view video sequence, wherein the vertical dimension is defined as the direction perpendicular to said epipolar line, and wherein ~~the~~ said search range is further constrained using a disparity vector computed for ~~the~~ said one or more pixels in the first frame and wherein ~~the~~ said constrained search range is repositioned relative to ~~the~~ said epipolar line using ~~the~~ said



disparity vector in addition to constraining ~~the~~ said vertical height using the first correlation,

search the second frame within ~~the~~ said constrained search range for a match of ~~the~~ said one or more pixels identified in the first frame for subsequent use in computing a difference vector for ~~the~~ said one or more pixels in the first frame, ~~the~~ said difference vector to be transmitted as part of a compressed representation of the first frame,

receive a second correlation between efficient and semantic accuracy from the user, and

search a third frame within a search range constrained by a second correlation between efficient compression and semantic accuracy, the second correlation specified by the user and the second correlation different from the first correlation.

26. A ~~motion difference vector~~ estimation apparatus comprising:

a block identifier to identify one or more pixels in a first frame of a multi-view video sequence;

a search range determinator to constrain a search range associated with a second frame of the multi-view video sequence to a first area vertically centered on an epipolar line in the second frame, wherein ~~the~~ said epipolar line corresponds to ~~the~~ said one or more pixels in the first frame, the first area is defined by a having a vertical height specified by a first correlation between efficient compression and semantic accuracy received from a user, wherein ~~the~~ said vertical height increases if the first correlation is weighted toward efficient compression and ~~the~~ said vertical height

decreases if the first correlation is weighted toward semantic accuracy, ~~and the~~ wherein semantic accuracy relies on use of geometric configurations of cameras capturing the multi-view video sequence, wherein the vertical direction is defined as the direction perpendicular to the epipolar line wherein ~~the~~ said search range determinator is configured to further constrain the search range using a disparity vector computed for ~~the~~ said one or more pixels in the first frame and wherein ~~the~~ said constrained search range is repositioned relative ~~the~~ said epipolar line using ~~the~~ said disparity vector in addition to constraining ~~the~~ said vertical height using the first correlation; and

a searcher to search the second image within ~~the~~ said constrained search range for a match of ~~the~~ said one or more pixels identified in the first frame for use by a difference vector calculator to compute a difference vector for the one or more pixels, ~~the~~ said difference vector to be transmitted as part of a compressed representation of the first frame, and to search a third image within a search range constrained by a second correlation between efficient compression and semantic accuracy, the second correlation received from the user and different from the first correlation.

***Allowable Subject Matter***

Claims 1-6, 9-17, 19-23 and 25-31 allowed.

The following is an examiner's statement of reasons for allowance:

Independent claims 1, 12, 20 and 26 relate to estimating difference, or disparity, vectors in a multi-view sequence. The claims require a search range in a second frame that is constrained to be centered on an epipolar line corresponding to selected pixels in

the first frame. The height of that search range is determined subject to constraints and a user inputted parameter that specifies a tradeoff between efficiency in compression and accuracy of the vector. The height being greater when efficient compression is desired and lower when higher accuracy desired. Wherein the vertical dimension and height are in the direction perpendicular to the epipolar line.

The closest art is Sohn in view of Carlborn and in further view of Guo and Hamani. Which discloses a video compression method in which a disparity search is performed in a search window in the second centered on a position co-located to selected pixels in the first frame. The prior art further discloses that epipolar constraints may be used to reduce the number of search candidates and that the search range may be varied in order to implement more efficient compression. However, the prior art techniques teach that a smaller search window leads to more efficient compression by reducing computation time. Further, the prior art does not disclose orienting the search range so as to be varied in height relative to an epipolar line.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JEREMIAH C. HUBER whose telephone number is

(571)272-5248. The examiner can normally be reached on Mon-Fri 8:00 a.m. - 4:30 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mehrdad Dastouri can be reached on (571)272-7418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Jeremiah C Huber  
Examiner  
Art Unit 2621

/Jeremiah C Huber/  
Examiner, Art Unit 2621

/Mehrdad Dastouri/  
Supervisory Patent Examiner, Art Unit 2621